

8/27/03

MEMORANDUM FOR: Height Modernization Contractor

FROM: Charles W. Challstrom
Director, National Geodetic Survey

SUBJECT: PROJECT INSTRUCTIONS: GPS Height Modernization
Project, Golden to Vail Pass, Colorado

This document contains specific instructions to accomplish the following height modernization survey:

1. Project Name: GPS Height Modernization Project,
Golden to Vail Pass, Colorado
2. Geographic Limits: Golden to Vail Pass, Colorado
3. Project ID Number: GPS-1880
- 4a. Size of Project: Approximately 73 miles
- 4b. Number of Points: ~~approximately 40 stations~~
60 stations
- 4c. LIDAR Project Area: None.
- 4d. LIDAR Parameters: None.
5. Points of Contact (e-mail both):

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This Height Modernization project shall include: GPS observations, data processing, data analysis, data adjustment, data submittal in specified formats, and preparing reports.

I. GENERAL:

The contractor shall perform a Height Modernization research project to evaluate the specifications and procedures set forth in the NOS-NGS-58 document, "GUIDELINES FOR ESTABLISHING GPS-DERIVED ELLIPSOID HEIGHTS". To do this, the contractor shall perform GPS observations along a recently established first-order level line from Golden to Vail Pass, Colorado. The contractor shall also perform GPS data reductions and adjustments, analyze the results, and submit all data in standard bluebook format to NGS.

II. PURPOSE:

This project will serve as an evaluation of the procedures and specifications in NOS-NGS-58. The recently established level line over which the GPS survey is to be done shall be used for direct comparisons between the leveled orthometric heights and the GPS-derived orthometric heights. The resulting GPS on benchmarks will further serve as valuable data for evaluation and enhancement of the national geoid model.

III. PROJECT DEVELOPMENT:

- The **CONTRACTOR** shall use material and data supplied by NGS to develop and submit a Survey Plan to NGS, in accordance with the "Scope of Work, Height Modernization and Lidar Surveys" (SOW) Version 10, dated June 16, 2003. NGS will supply the contractor with material and data from field reconnaissance including station descriptions, digital photos, visibility diagrams, and a list of the proposed stations. NGS will also supply the contractor with GPS data collected at Primary Base Stations for processing and adjustment. Prior to submitting a Survey Plan, the **CONTRACTOR** shall submit a cost estimate for the survey based on assumption that the survey will include 60 40 stations, which are to be (roughly) evenly spaced throughout the entire level line. The total length of the line is approximately 73 miles. The cost estimate shall also include (with separate sub totals): ~~processing and adjustment of the Primary Base station data. 1)~~ reconnaissance for only the 60 stations including recovery notes, photos, visibility diagrams, and pencil rubbings, 2) observing and processing the Primary Network.

IV. DATA ACQUISITION:

GPS observations shall be done in accordance with the SOW with the following exceptions:

The **CONTRACTOR** shall ~~not~~ perform observations for five (5) the ~~Control or Primary Base stations~~; ~~NGS will perform these observations and deliver the GPS data to the contractor for processing and adjustment.~~ stations HEID, WESTTUN, D7, IDAHO, and RMCL 100 shall each be observed simultaneously in three sessions of 5.5 hours each.

The **CONTRACTOR** shall not perform portions of Section 10.2, Reconnaissance. ~~NGS will supply the Contractor with material and data including station descriptions and recovery notes, digital photos, and visibility diagrams of the proposed stations. (NGS has already visited the 60 stations and determined them to be usable.)~~

The **CONTRACTOR** shall not perform Section 10.4, Mark Setting.

The **CONTRACTOR** shall not perform any of Section 11, Survey Work for LIDAR Surveys. Furthermore, the contractor shall not perform any LIDAR work outlined in Sections 12.2, 13.13, 13.14, and 13.15.

~~The **CONTRACTOR** shall not be responsible for the Descriptions or recovery notes in Section 13.12.~~

The **CONTRACTOR** shall observe all 60 stations in the local network (which includes the 5 stations in the Primary Network) for 60 minutes instead of the 45 minutes specified in Section 10.5.

The **CONTRACTOR** shall submit a 2-3 page Executive Summary of a Quality Control Plan in lieu of a detailed Plan in accordance with Section 13.3

The **CONTRACTOR** shall consult with NGS regarding GPS rotation and scale parameters to be used during the adjustments in Section 13.10.

V. DATA PROCESSING:

All GPS data processing, adjustments, and reports shall be done in accordance with the SOW. The final bluebook to be submitted to NGS shall include all data collected.

VI. DATA ANALYSES AND EVALUATION OF NOS-NGS-58:

The **CONTRACTOR** shall reprocess and analyze the local GPS dataset as follows:

1. Reprocess discrete samples of the GPS dataset simulating the specifications and procedures in NOS-NGS-58, i.e., a subset of the data will be extracted and processed separately that simulates a survey project designed to follow the procedures outlined in NOS-NGS-58 for a Local Network. Each simulated observing session shall include 30 minutes of data, and each station shall be included in at least two simulated

sessions.

2. Conduct further analyses by reprocessing with 45 minute sessions. Compare all computed positions with those developed from the processing of the entire dataset and prepare a spreadsheet showing the height differences. Include in the spreadsheet the published orthometric heights from the leveling project along with the GPS-derived orthometric heights from each of the three tests. (Test #1 is the results of the 60 minute session data reduction, Test #2 is from the 45 minute session data reduction, and Test #3 is from the 30 minute session data reduction.)
3. In consultation with NGS, recommend additional tests and analyses.

VII. DATA TRANSMITTAL:

The **CONTRACTOR** shall furnish all project deliverables to NGS within 3 months from the final date of observations.

The Contractor shall submit to NGS the initial minimally constrained adjustment before continuing with additional data processing. NGS will review and comment on this adjustment as soon as possible, normally within 5 working days.